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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/728,706 | 12/05/2003 | Kang-Hyun Lee | OPP 031367 US | 9971 |
| 36872 | 7590 | 12/15/2004 | EXAMINER | |
| THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C. | | | BEREZNY, NEMA O | |
| 7257 N. MAPLE AVENUE | | | ART UNIT | |
| BLDG. D, 3107 | | | PAPER NUMBER | |
| FRESNO, CA 93720 | | | 2813 | |

DATE MAILED: 12/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/728,706

Applicant(s)

LEE, KANG-HYUN

Examiner

Nema O Berezny

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>12052003</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claims 1-17 are currently pending.

Specification

The disclosure is objected to because of the following informalities: Applicant's specification (para.20 and claims 7, 10, 14, and 17) discloses a metal wiring in which a *lower* TiN/Ti layer is defined as a *capping* layer, and an *upper* TiN/Ti layer is defined as a *barrier* layer. However, the conventional nomenclature defines the lower layer as a barrier layer in which it functions as a barrier between the silicon substrate and the main interconnect metal (e.g. copper), and the upper layer is defined as a capping layer in which the interconnect is covered or capped, as the name implies.

Appropriate correction or explanation is required. Examination has been conducted interpreting the lower layer as a barrier layer and the upper layer as a capping layer.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 and 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Narita et al. (6,383,942) in view of Hart et al. (2003/0034325). Narita discloses a

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method for fabricating a metal line of a semiconductor device, comprising the steps of: forming an insulation layer on a semiconductor substrate on which devices or lower lines are formed (col.12 lines 26-27); forming a metal layer on the insulation layer (col.12 lines 26-42); forming a photoresist pattern having an opening of certain width on the metal layer (col.12 lines 48-53); and selectively removing the metal layer at a lower side of the opening by performing a dry etching process (col.12 lines 56-59). However, Narita does not disclose forming a buffer layer. Narita would look to one such as Hart for device protection because Hart discloses forming a buffer layer on the photoresist pattern (p.2 para.18,19). Hart also discloses wherein the buffer layer is made of an oxide film of PE family (p.2 para.20). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the buffer layer of Hart with the method of Narita to protect the device from mechanical damage (Hart - p.2 para.19) **[claims 1, 3]**.

Based upon the rejection of claims 1 and 3 above, Narita also discloses further comprising a step of forming an organic anti-reflection coating between the metal layer and the photoresist pattern (col.12 lines 43-45) **[claim 2]**; wherein the dry etching process is performed by a plasma etching using Cl_2/BCl_3 gases (col.13 lines 1-16) **[claim 11]**; wherein the metal layer comprises three layers of a lower metal layer, an intermediate metal layer and an upper metal layer (col.12 lines 26-42) **[claim 12]**; wherein the lower metal layer is made of TiN/Ti (col.12 lines 29-33) **[claim 13]**; wherein the lower metal layer functions as a capping layer (col.12 lines 29-33) **[claim 14]**; wherein the intermediate metal layer is made of Al-Cu alloy (col.12 lines 33-38) **[claim**

15]; wherein the upper metal layer is made of TiN/Ti (col.12 lines 38-42) **[claim 16]**; and wherein the upper metal layer functions as a barrier layer (col.12 lines 38-42) **[claim 17]**.

Claims 4-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Narita et al. (6,383,942) in view of Hart et al. (2003/0034325). However, Narita in view of Hart do not disclose a buffer layer thickness of 180 to 230 Angstroms. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990) **[claim 4]**.

Based upon the rejection of claim 4 above, Narita also discloses wherein the metal layer comprises three layers of a lower metal layer, an intermediate metal layer and an upper metal layer (col.12 lines 26-42) **[claim 5]**; wherein the lower metal layer is made of TiN/Ti (col.12 lines 29-33) **[claim 6]**; wherein the lower metal layer functions as a capping layer (col.12 lines 29-33) **[claim 7]**; wherein the intermediate metal layer is made of Al-Cu alloy (col.12 lines 33-38) **[claim 8]**; wherein the upper metal layer is made of TiN/Ti (col.12 lines 38-42) **[claim 9]**; and wherein the upper metal layer functions as a barrier layer (col.12 lines 38-42) **[claim 10]**.

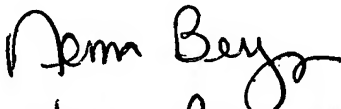
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nema O Berezny whose telephone number is (571) 272-1686. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NB


Nema Berezny